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Shoulder dislocation

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During my preceptorship this summer I camein contact with the problem of shoulder dislocations. In this community we had two cases within a week. I was fascinated by the ease by which they were reduced and the almost complete relief from pain when reduction was accomplished. I had known that although the usual case of a dislocated shoulder is fairly simple to reduce, a nerve compression is possible, and this may result in muscle group atrophy. I began to speculate on the serious consequences following a seemingly simple procedure. I wondered if the general practitioners, who deal with this problem, are impressed enough by the possible consequences and ramifications. I will attempt to discuss the types of most common shoulder dislocations, with regard to etiology, treatment, and prognosis.

The incidence of shoulder dislocations is very hard to ascertain. But certainly due to its extremes in ranges of motions, dislocations of this joint are more common than those of all other joints taken as a whole. This was known to Sir Astley Cooper who wrote an excellent article on this

subject in 1825. As would be expected those who engage in

activity requiring heavy usage of this joint are subject to more dislocations. As regards sports the glenohumeral joint is the most frequently dislocated. In some series the figure of 60 per cent of all dislocations were of this joint. This figure is very high, and no doubt is so because many of the cases counted were reoccurrences.[15] It is not hard to imagine that once the intact shoulder capsule has been injured, recurrences would be expected. In one series of over three hundred shoulder dislocations, over 90% of the patients under 20 years of age recurred, about 75% of those of 20 to 40 years of age, and 15% of those over 40 years of age. Anterior dislocations by far out number the posterior type which is in part due to the muscular support on the posterior aspect of the capsule.[15] An interesting fact on recurrences is that the inflammatory response in a young person is much less severe than the response in an older individual. Those dislocations which tended to recur are those which were followed by a speedy recovery of function and minimal discomfort. Moseley then believes age and not the position of the dislocation a determining factor in recurrences. This would be in keeping with the factor that viscera and tendons when surgically cut tend to heal with greater tensile strength than they had originally before the inflammatory response.

The subsequent fibrosis must strengthen these structures. Looking at the anatomy of the shoulder one wonders how this poor mechanical unit is able to function. The head of the humerus is four times larger than the glenoid surface. It articulates with it at almost a 90 degree angle.[3] The shoulder is attached to the trunk by the small sternoclavicular joint.[20] The joint capsule itself is very loose to allow for the wide range of motion. The anterior capsule consists of the synovial membrane, the capsule (gleno-humeral ligaments), glenoid labrum, scapular periosteum, subcapsular bursa, and the subcapularis muscle.[17] Even though there are ligaments present, these are weak, and the anterior portion of the shoulder is not supported as well as the posterior capsule. The posterior capsule consists of the capsule, synovial membrane, labrum, periosteum, the posterosuperior cuff and the supraspinatus, infra spinatus, and teres minor. The strong muscular support of the posterior capsule makes posterior dislocation very rare. The Lahey Clinic reports only about one case yearly.[7]

Some force is usually necessary to cause an initial dislocation, but it should be kept in mind that a recurrent dislocation may need no other insult than the appropriate movement of the humerus to a weakened portion of the capsule. About 5% of

individuals have various types of bony, cartilaginous, and muscular anomalies which also may contribute to recurrences as well as to a weakened or defective unit initially.[3, 20]

The initial insult which causes the dislocation may result from trivial trauma, such as sneezing, reaching for an object, or turning around. Those who experience this type are usually lean non-athletic individuals, possessing a body habitus commonly known as asthenic. In a more muscular individual the initial force which results in anterior dislocation is a backward fall on the elbow. This drives the humeral head straight forward, and Bankart believes this to be the mechanism which accounts for the recurrent problem. He suggests the labrum doesn't heal properly and remains detached from the bone leaving the anterior support and entire capsule more lax.[3, 15, 4]

Mosely postulates the anterior subluxation results from a force which abducts and externally rotates the humerus. The neck rests on the acromion as a fulcrum to lever the head from the fossa antero inferiorly. If the arm were fully abducted, the subglenoid type would result. Since it would be more common not to have the arm fully abducted, the most common type, the subcoracoid type would result.[8] Anterior subluxications may also result from a blow to the posterior part of the shoulder.

Posterior dislocations, in contrast to the external rotation of the anterior type, are preceeded by internal rotation, forward flexion, and adduction which forces the head of the humerus posteriorly. This type of dislocation may also result from a blow to the anterior shoulder.[7]

The etiology of recurrent dislocations is still being disputed and probably will remain a sore point for debate in years to come. There are many contributing factors - a few of which I will try to enumerate. After one dislocation the entire tearing and stretching of the tissues around the joint must contribute to recurrences.[15] Measurement of the joint after dislocation indicates an increase in joint capacity. The atrophy secondary to using the non affected limb may weaken the joint. Degenerative joint disease may change the entire joint as well as the head of the humerus and contribute to various shapes which may predispose for easier exit from the capsule.[16] Localized anterior leisons found in the anterior capsule are a disrupted labrum and scapular periosteum, a fractured anterior bony rim, an enlarged capsule creating a hernia pouch, and a lax and lengthened subscapularis tendon.[5] Leisons in the posterior capsule are usually lengthening of the supraspinatus, infra-spinatus and teres minor muscles, and stretching of the postero

superior capsule. This may result on the characteristic hatched head on wedge-shaped defect. Both of the ensuing types of deformities lead to a decrease in the arc of articulation which increases the change of future dislocation.[15, 16]

The picture seen in an acute injury is fairly characteristic. After a history of some time of trauma, there is usually pain referred and localized in the shoulder region and the deltoid muscle may be flattened. There is usually gross asymmetry of the two shoulders. The shoulder is very painful to move and the limb is useless. In a typical subcoracoid displacement the arm is usually fixed in abduction, the deltoid is flattened, the acromion process is prominent as is the subcoracoid area, the elbow flexed, and the foreman pronated.[8]

Radiologic examination of the involved area is necessary to rule out possible fractures of the humeral head, greater tuberosity, and the glenoid fossa. The types of dislocations give characteristic displacement of the head of the humerus, and a post reduction film is needed to establish complete reduction.

The case of recurrent dislocations seen in the interim between dislocation must of necessity rely more on the radiographic evidence for the involved shoulder may look clinically completely

normal. The best views are AP and auxillary with the joint in 45° abduction and 60° internal rotation. This position can most readily demonstrate the notched defect in the posterior part of the articulating head of the humerus. Increasing numbers of recurrences deepen this notch because of the presence of the glenoid rim. There also may be seen a vertical line of opaqueness which is thought to be sclerosed bone at the site of the initial compression fracture. Also infrequently seen are a lipped glenoid, cystic areas in the humeral head, and loose bone fragments. The auxillary view will adequately demonstrate whether the dislocation is anterior or posterior, and it is needed even though posterior subluxation is uncommon to institute proper therapy.[3] The treatment should be aimed at re-establishing the efficiency of the joint as soon as possible and preventing recurrences.

In any dislocation, closed reduction should be tried first because it almost completely relieves the discomfort, and this method is successful in an overwhelming majority of cases. The usual closed reduction procedure for the anterior dislocation is to have the patient relaxed by analgesia or anesthesia and exert firm steady downward traction on the arm while in abduction, and then abduct the arm while maintaining the traction.

This maneuver usually produces an audible snap of the humerus re-entering the glenoid fossa. The arm is gently rotated externally and internally with traction. Then the arm is laid across the chest.[6]

Kocher's method of reduction published in 1870 consisted of preliminary stretching in the bony axis with steady traction, rotating the arm externally to about 80 degrees, bringing the elbow forward near the midline of the trunk, rotating the arm internally, and placing the hand on the opposite shoulder. This method should not be employed initially because of the very real complications of vessel rupture and brachial plexus damage, which may ensue by levering the humerus through the capsule into the glenoid cavity.[9] The humerus may be fractured during this type of movement. A vulsion of the rotator cuff and damage to the circumflex branch of the auxillary nerve may ensue.[8]

Although general anesthesia is used for anesthesia in most cases, the British believe a "hanging-arm" technique is successful without discomfort to the patient. This would abandon the use of general anesthesia. While lying prone on a table, the dislocated shoulder being allowed to hang freely over the side of the table, the physician grasps the epiconydles of the humerus. His free hand he then places on the inside of the arm.

The forearm is flexed across the bend in the physician's elbow. With steady traction, the arm is abducted, flexed forward, and slightly internally rotated. If this doesn't accomplish reduction, the hand on the inner aspect of the arm lifts the humerus back into the fossa.[9]

General anesthesia may also be omitted if a muscle relaxant is used. This method may be especially useful in recurrent dislocation when you don't desire the risk of anesthesia mortality. With a good muscle relaxant to dissipate the muscle spasm and guarding, the earlier method of placing a weight on the freely hanging arm of the subluxed extremity may easily reduce the dislocation. I believe that many unnecessary general anesthetics could be avoided if reduction was attempted in this manner initially,[22,23]

After reduction has been accomplished, it has been repeatedly proven that a high recurrence rate accompanies dislocations which weren't immobilized. There is conflicting evidence as to the length of immobilization, but immobilization for any longer than about three weeks doesn't seem to decrease recurrences.[20] When the patient is older or the problem is recurrent, the immobilization may do no good whatsoever and may do no immobilize these types. The method of

immobilization usually consists of wrapping the arm to the trunk, using a sling on the forearm. After about one month, progressive resistance exercises and motion within a painless arc may be instituted. When the power of the shoulder has been increased, push-ups with the hand placed in three positions should be used.

For a recurrent problem, self-reduction may be accomplished by placing the opposite fist in the affected auxilla and using this as a fulcrum to replace the humeral head.[15,16]

For a posterior dislocation, reduction is attempted by gentile traction in abduction, pushing the humeral head forward, and external rotation of the shoulder. If this fails or if this has been a recurrent problem, open reduction may be used where the subscapularies tendon may insert into notch in the humeral head.[7]

Some of the complications which you may be faced with after a seemingly ordinary reduction are many. A loss of power and sensation may occur in the deltoid area secondary to compression of the auxillary nerve, usually its circumflex branch. Although the figures vary greatly on nerve injury incidence, it is not at all uncommon. Even brachial plexus

paralysis has been reported following this type of dislocation, more commonly following a long period of time while the injury remained unreduced. The edema after the injury makes the nerves more susceptible to injury and further stretching. The treatment is usually conservative, and the prognosis is generally good.[10] Sensory pre and post reduction tests are mandatory to exclude nerve involvement. Vascular leisons were no doubt more common in the 1800's when reduction was carried out in a rougher fashion not at all unlike Hippocrates' method of foot in the auxilla and a firm pull.[12] Transient vascular phenomena consisting of cyanosis and swelling may also occur. Simmons demonstrated that if an artery is stretched it will become spasmotic, and spasm is postulated to explain this very alarming consequence.[10] The treatment for a ruptured vessel is arterial repair, but in young patients ligation is adequate, and good collateral circulation is usually maintained.[12]

After the second dislocation, surgery should be advised to minimize secondary joint changes. Surgery, with open reduction may be necessary in those difficult initial cases when the joint cannot be reduced without forceful maneuvers. There is usually some cause for the difficulty in reduction.

Usually the glenoid fossa is blocked by the rotator cuff, the inferior capsule, or the biceps tendon.[8]

Regarding the various operative procedures which are in many ways similar, the type of incision according to Mosely should be S-shaped and should extend to the auxilla to minimize the unsightlyness of straight anterior scars. The goal of any procedure is the repair of the anterior capsular mechanism and to restore full joint motion.

The Bankart and Putti-Platt procedures, although described before 1925, have been used extensively since about 1945 and almost exclusively at the Mayo Clinic since 1946.[14] This technique approaches through the deltopectoral groove, coracobrachalis muscle is divided near its origin on the coracoid process, and the subscapsularis is divided about 2 cm from its insertion. The capsule is separated from the subscapsularis and incised. With the glenoid labrum exposed, the proximal capsule is sutured to the destal part of the subscapularis. The capsule and subscapularis are shortened, plicated, to form the basis of the repair. The proximal subscapularis is pulled laterally and sutured near the bicipital groove. In a study at the Mayo Clinic from 1945 to 1959, 87 recurrent anterior subluxations were seen, and repaired by this combined

method. A recurrence was noted in only 1.3%, and residual pain no longer remained a problem in the majority of patients.[21] This procedure is technically difficult, and some claim the extensive dissection and following fibrous tissue reaction to account for its success rather than the reattachment of the torn glenoid.

In his original article in 1923 Bankart objected to plication. His procedure was to expose the anterior margin of the glenoid cavity completely. A sandbag was placed beneath the scapula to keep it forward, and the arm was rotated internally to relax the pectoralis major muscle. An incision beginning above the coracoid process was made and extended down and out about five inches. The deltoid and pectoralis major muscles were divided. The coracoid process is divided with an osteotome and drawn medially with the attached pectoralis minon, biceps, and coraco-brachialis muscles.[13] Then the subscapularis tendon is separated near its insertion and drawn medially. The defect usually present is a joint defect of the glenoid ligament. The free edge of the capsule and the glenoid ligament are reunited by interrupted silk sutures between these structures. He advocated freshening the bone on the scapula neck so the glenoid ligament may adhere to it. The subscapularis tendon is sutured

together, the detached part of the coracoid process is sutured in place, and the wound closed. Postoperatively, the arm is kept at rest for four weeks.[1]

The Putti-Platt procedure was a term used and reported by Osmond-Clark in 1947. The Bankart procedure enjoyed much popularity for about ten years after its inception in 1923. But many realized that a gross leison of the glenolabrial margin wasn't always present. Platt, since there was no constant capsule leison, felt that suturing the distal end of the subscapularis tendon to the cartilaginous glenoid margin would greatly reduce recurrences. The proximal end of the subscapularis was sutured to the anterior capsule. This caused an overlap and shortening of the tendon. Putti had been performing this same type of operation since 1923; and he may have learned this procedure from Codivilla, his teacher, who like Platt never described it in literature. Since Putti performed it, and Platt thought it out and performed it independently, the combined name was arrived at.

The procedure utilizes an anterior incision extending inwards along the outer one-third of the clavicle medial to the coracoid process and extending downwards for about six inches. The groove between the deltoid and pectoralis major muscle is

widely opened. This is easily accomplished if the deltoid muscle is almost completely divided three-eights of an inch distal to bone. Resuturing is easier if the division is made through muscle than if the division is made subperiostfally. With the coracoid process exposed, the conjoined tendon of the coraco-brachialis and the short head of the biceps are freed and retracted inferiorly. This tendon must not be freed too extensively along its medial border nor pulled on too vigorously to avoid nerve damage. The subscapularis tendon is divided one inch from its insertion, and usually the capsule is opened because of its adherence to the tendon. The subscapularis is retracted medially by sutures. The distal end is sutured to the most convenient soft tissue structure along the anterior rim of the glenoid cavity. A small cutting needle, strong chromic gut, a powerful needle-holder, and adequate retraction of the humeral head are all that is needed. There is no risk of causing further damage to the anterior margin of the glenoid or articular cartilage. Four sutures are tied while the limb is internally rotated, and the medial part of the capsule is drawn outwards to overlap the subscapularis giving a "double - breasted" effect. Suturing of the belly of the subscapularis to the tendinous cuff gives even further overlapping and causes shortening of the subscapularis.

This shouldn't be overdone. It should be possible to rotate the arm outwards to the neutral position. If the muscle is shortened more, an internal contracture may persist. The conjoined tendon is reattached to the coracoid, the deltoid to the clavicle and pectoralis major, and the incision closed.[18]

The Nicola procedure has had two modifications since its origination in 1929, when the long head of the biceps was passed through a tunnel to act as a stabilizing ligament. In 1939 a strip of the joint capsule was used to reinforce the biceps. In 1953, the Bankart or Putti-Platt exposure was used, the deficit was repaired, and the tenodesis performed. In a series of twenty-one cases of recurrent anterior dislocation from 1947 to 1959 repaired in this manner, no recurrences ensued. Shoulder motions were limited from five to fifteen degrees in both abduction and external rotation.[11] This procedure remains technically difficult, and many shoulders remain painful. A high rate of recurrence is claimed in other studies.

The Magnuson-Stack operation, less difficult than the preceding, consists of splitting the deltoid muscle to expose the anterior shoulder joint. The subscapularis muscle is elevated from the humerus to facilitate the freeing of its attachment to the capsule and humerus. An incision is made along the upper and

lower borders of the subscapularis tendon through the capsule, and the tendon is cut free from the bone. After the musculotendinois attachment is freed, internal rotation brings the bicipital groove and the greater tuberosity into view. While maintaining traction on the detached tendon of the subscapularis, a place on the upper greater tuberosity is selected for transplanting this tendon. A groove is made in the greater tuberosity, and some holes are drilled through which sutures are passed. Sutures are taken into the cut end of the subscapularis tendon, and the tendon is transplanted into the depth of this groove. The upper and lower borders of the tendon are sutured to the nearby capsular structures to close the capsule defect and to reinforce the transplant. This is very important and prevents the superior slipping of the tendon when the extremity is abducted. A series of twenty-four shoulders showed recurrence of about 10%, and all were able to abduct the arm 80^{o} - 90^{o}. One-half had external rotation limitation from 5^{o} - 15^{o}, and the remaining from 60^{o} - 80^{o}.[19] Many are now proponents of using a Vitallicm rim to hold the sutures.[16]

The key to shoulder stability is the fact that the glenoid is movable, and by this ability is able to adjust to every position of the head of the humerus. The recoil ability of the glenoid also

absorbs much of the shock by the scapula sliding along the chest wall.[2] The contact of the rotation cuff with the humeral head also acts to place the humeral head directly into the glenoid fossa.[20]

The mechanisms causing and reduction techniques of shoulder dislocations are reviewed above. Several operative procedures are discussed for recurrent dislocations, and a good rationale approach seems to be an S-shaped incision and use of the Putti-Platt method. This technique in experienced hands results in a considerably lower incidence of recurrence. Due to some technical difficulties in the procedure, this should only be attempted by one skilled in its use.

The ordinary shoulder dislocation may be reduced by several simple techniques. A pre-reduction x-ray and sensory test are needed to exclude nerve injury and fractures. The reduced joint should be immobilized for about one month. Then gradual progressive exercises within the painless arc of motion should be instituted. I believe a dislocation which isn't reduced by normal force or a recurrent subluxation deserves the opinion of a specialist. In my opinion the Putti-Platt procedure has proven to have the best results.

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